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SURVEY OF THE MARKET FOR MUSSELS AND MUSSEL PRODUCTS

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SURVEY OF THE MARKET FOR MUSSELS AND MUSSEL PRODUCTS

March 1988

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REPORT

SURVEY OF THE MARKET FOR MUSSELS AND MUSSEL PRODUCTS

Harmsma, H

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60 pp., 29 tabs, 3 figs, 2 apps.

The report deals with the developments that have taken place in the market for fresh mussels and processed mussel products. Both the supply and the demand sectors have experienced rather significant shifts.

A number of foreign producers have increased their mussel supply considerably. In the last few years Dutch supply has become increasingly dependent on imports. Through higher import levels a substantially higher level of mussel supply for retail and processing has been maintained for several years, and this has ultimately also had a favourable effect on sales. Major changes have also taken place in the commodities sold. Today processed mussel products make up a large proportion of total sales.

The report also discusses the developments in the various markets and the possible consequences for the Dutch mussel sector. A number of connections between various trade statistics are tested by means of a simultaneous estimation model.

Fisheries/ Mussel farming/Market structure/The Netherlands/Fish-processing industry/International trade .

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Foreword

This publication describes developments in the market for mussels and mussel products. Since the appearance of the last market survey (Mussel Market Survey, JGP Smit, 1979) fairly extensive shifts have occurred in both supply and demand. In addition to describing these developments, the report attempts to deal with the possible consequences for the mussel industry.

A word of thanks is due to the business sector, particularly the Mussel Office in Bergen op Zoom, which kindly provided us with data.

(Sgd)
J. de Veer
Director

The Hague, March 1988

Abstract

The total world mussel supply has grown almost continuously in the past ten years. Between 1974 and 1985 the total supply increased by around 200 million kg to over 700 million kg. This increase was mainly due to the use of new cultivation areas. Generally speaking, existing areas were unable to support any significant increase in production. In such cases the main impediments are usually lack of space in coastal waters, a limited food supply for the mussels and pollution problems.

The principal suppliers of mussels in Europe are: Spain, the Netherlands, France, Denmark and West Germany. Outside Europe the main suppliers are China, Thailand and South Korea. In the last decade in particular quite a number of countries have started mussel fishing or farming. West Germany and Denmark, for example, have seen a rapid growth in their mussel supply. In the last few years the German mussel supply has been two to five times as high as it was in the seventies. This growth is largely attributable to Dutch business activity in Schleswig-Holstein.

Since interest in mussel fishing and mussel farming continues to increase, we may expect that new producers will continue to try to find a place in the market in the future. The development of farming techniques and distribution channels will of course take time and energy.

The mussel supply in the Netherlands

The mussel supply for the Dutch market and processing industry

has increased significantly in recent years. The net supply of an average of 900,000 mussels in the seventies climbed to at least 1.2 to 1.4 million tonnes* a few years ago. The increased supply is due mainly to the sharp rise in imports. The Dutch mussel supply continues to hover around the 1 million tonne mark. The quantity of mussels taken by the Mussel Fund has been reduced, and this has slightly increased the net supply. Supply levels may change considerably from season to season. The mussel supply from the Waddenzee in particular has proved to be very unstable. Since prices are very dependent on supply levels, they have at times seen dramatic rises.

Around 1980 Dutch mussel markets and the Dutch mussel processing industry experienced difficulties due to a low level of supply and high prices. This was a major inducement for a number of Dutch commercial enterprises and processing plants to start business activities in West Germany. Through the establishment of mussel farming and processing businesses, imports reached a structurally higher level. Total imports rose from an average of 80,000 tonnes in the seventies to 200,000 to 500,000 tonnes in the last few years. Large quantities of mussels are also being exported to the Netherlands from the adjacent Danish tidal flats.

As a result of the higher import levels, which sometimes constitute almost 50% of the total supply, Dutch mussel growers are no longer totally responsible for the domestic supply when it comes to crop yield. In the early eighties in particular this led to a series of low summations. Subsequently there was a marked improvement in results caused by greatly increased sales of mussels and mussel products.

* Revisor's note: Literally translated: 'mussel-tons'. According to the equation on p. 14 of the translation: 708 million kg (7.08 million mussel tons), 1 'mussel-ton' = 100 kg. (See p. 11 of orig.). In this translation, therefore, 'tonne' means 100 kg, unless otherwise indicated.

Mussel sales

After the slump around 1980 the fresh and processed mussel market recovered very well. The average sales figure for the '83/'84 to '85/'86 seasons was even almost 40% above the average for the seventies. Because the supply level remained high and stable for a number of years, virtually all clients could be accommodated even in the years when the Dutch supply was low. Moreover, the high import level of cheap mussels resulted in a substantial reduction in the average cost price on the market. Nevertheless the higher imports have so far not always been sufficient to keep the supply at a high and stable level. In the '86/'87 season a disappointing supply level in both the Netherlands, Germany and Denmark caused prices to rise sharply again. The total mussel supply available for the market and the processing industry was below that of the previous seasons.

Of all mussel sales, sales of processed mussels saw by far the greatest increase. The processed mussels' share of the market rose from 15% in the '80/'81 season to over 30% in the '85/'86 season. The market for fresh mussels received a weaker boost: it rose from an average of 537,000 tonnes in the seventies to 615,000 tonnes (average) in the '83/'84 to '85/'86 seasons. The market for fresh mussels virtually remains limited to Belgium, France and the Netherlands. Virtually no fresh Dutch mussels are sold outside these areas. The main factors preventing the establishment of new markets are the fact that the product does not keep very long and the high initial expenses for setting up new distribution lines.

Domestic sales of fresh mussels showed the highest relative

increase. Since it was possible to interest a large group of new consumers in the mussels, domestic sales jumped from 39,000 tonnes in the first half of the seventies to around 100,000 tonnes in the '83/'84 to '85/'86 seasons. Exports to Belgium, the principal buyer of fresh Dutch mussels, also rose somewhat to 250,000 to 300,000 tonnes. Both Belgium and the Netherlands are now virtually without competition from abroad.

France, on the other hand, is providing the Netherlands with the necessary competition. A temporary sharp rise in the French mussel supply caused Dutch exports to plummet. This decline was reinforced by the low supply and high market prices around 1980. Since then exports to France have recovered somewhat although they have not returned to the level of the early seventies, which is partly attributable to increased imports from Ireland.

In both Belgium and France an ever increasing part of the fish (including mussel) retail industry is using supermarkets and hypermarkets. The Netherlands, too, already has a number of plans in the works for selling fish in supermarkets; these plans are almost ready to be implemented. For businesses dealing in mussels this may mean a higher concentration among the buyers, thereby strengthening their market position, but it may also mean that special client demands relating to logistics, packaging and reliable delivery are brought to the fore.

The sale of processed mussels has almost tripled since the seventies. Expressed in net product weight, sales rose to 330,000 tonnes in the '85/'6 season. In addition to semi-preserves (the familiar jars

of pickled mussels), cooked and deep-frozen mussel meat has become popular, particularly in the last few years. In the '85/'86 season cooked and deep-frozen mussel meat already accounted for some 50% of total sales of processed mussel products.

The principal markets for processed mussels are the Netherlands, Belgium, France and West Germany. France and West Germany in particular are experiencing keen competition from preserved mussel products from other countries. Both the decline in sales around 1980 and the recovery and growth of sales after 1980 were strongest in those countries. The major competitor for the Dutch mussel industry is Denmark. A smaller degree of competition also comes from Spain and South Korea. Since other countries are also beginning to produce processed mussels, competition may continue to increase in the future.

Stabilization of the supply and the lower raw material (ie. mussel) prices have been important for the sale of processed mussels in particular. Since a large proportion of these sales occurs through the foodstuffs sector (ie. groceries and supermarkets), reliable delivery and predictable prices that are not too high are important matters. Since buyers are much less interested in the origin of the product than they are in the case of fresh mussels, they will be more ready to change suppliers in the event of a hold-up in supplies. Such a situation occurred in the early eighties. Through product development and other means processed mussels can be given an extra "added value" so that in the long term sales will be less influenced by supply hold-ups and high prices.

1. Introduction

This report discusses developments in the market for fresh and processed mussels. In the past several years quite a few changes have taken place in both supply and demand. On the supply side, various foreign producers, including West Germany and Denmark, have increased their supply substantially. In spite of this increase in and expansion of supply, Yerseke has easily maintained and even enhanced its position as mussel processing centre (the Waddenzee for its part became a major mussel growing area in the fifties). Yerseke's success is largely attributable to the suitability of the Eastern Scheldt as a freshwater cleaning area and Yerseke's easy access to the major markets. The decision to keep the Eastern Scheldt open also meant that Yerseke could retain its position as a commercial and processing centre. Through more imports the total supply available for the market grew considerably.

The scope and makeup of Dutch mussel sales also changed somewhat. Sales of processed mussel products, preserved mussels and deep-frozen mussel meat in particular increased significantly.

Chapter 2 deals with developments in the mussel supply, both in Western Europe and worldwide. These developments are important internationally for two main reasons: the potential competition and the potential markets for processed products. In Western Europe the mussel supply is also important in terms of the supply of raw materials and the marketing of fresh mussels. Chapter 3 describes the market supply of Dutch fresh and processed mussels. A schematic overview is provided of the connections between the various commercial trends.

Appendix 1 provides a mathematical calculation of the links between the various commercial statistics. Chapter 4 describes the development of the various markets for mussels and mussel products.

The conclusion discusses the possibilities and limitations and strengths and weaknesses of the Dutch mussel industry.

2. Developments in the supply of mussels

2.1 The world mussel supply

According to FAO statistics the world mussel supply has increased appreciably in the past decade. In 1984 the total world supply was 708 million kg (7.08 million tonnes) as compared with 486 million kg in 1974. After a period of virtually continuous growth, the mussel supply seems to be stabilizing somewhat now (see Table 2.2). The increase in the total world supply was caused largely by the sharp rise in the mussel supply in Denmark, West Germany, China and Thailand.

Nor was it only the mussel supply that increased. A sharp rise in the supply of other shellfish was also observed. The growth in the mussel sector was even slower than it was with some of the other shellfish.

Table 2.1 Total world shellfish supply in millions of guilders

Year	1974	1979	1984	Increase in 1984 over 1974 (%)
Mussels	486	572	717	+ 48
Oysters	739	873	959	+ 30
Clams, cockles	727	1110	1492	+ 105
Ark shells				
Scallops	238	411	818	+ 244
Other shellfish	204	125	167	- 18
Total shellfish	2394	3091	4153	+ 73

Source: FAO

As the above table shows, the share of mussels in the overall shellfish supply is rather small (20%). Although the discrepancies among the shellfish types are fairly high in some cases, it is possible that if mussel production were expanded mussels could supersede other shellfish. The reverse situation could also occur however.

The FAO, in dealing with the world mussel supply, distinguishes twelve types of mussel, of which the common mussel (mytilus edulis) is by far the most important. The common mussel, which is found mainly in Western Europe, is not very homogeneous however. Mussels produced by bottom culture (Northwestern Europe), post culture (France) and suspended culture (Spain) are all considered to belong to the common mussel family.

The share of the common mussel in the total world supply has been fluctuating around 55% in the past decade even though there are large annual discrepancies. The world supply of the common mussel has increased owing to the dramatic growth in the supply in Denmark and West Germany. The Netherlands' share in the overall world supply has gradually decreased somewhat because of the development of new production areas.

The main producers outside Western Europe are China, South Korea and Thailand. The mussel supply of these three countries varies a great deal, usually fluctuating between 500,000 and 1 million tonnes.

Other countries outside Western Europe, too, are increasingly seeing that mussel fishing offers prospects for both exports and domestic food supply (especially developing countries such as India).

Table 2.2 World mussel supply in millions of kg (Cont'd on p 17)

Year	74	75	76	77	78	79	80	81
Total world supply	486.2	583.9	610.3	625.4	571.7	587.2	618.1	659.1
Of which common mussels (Mytilus edulis)	287.4	317.2	258.1	305.2	315.7	318.5	368.8	380.3
- Western Europe	285.2	315.1	255.0	299.7	308.0	311.4	362.5	373.2
- Northern Europe	2.2	2.1	3.1	5.5	7.7	7.1	6.3	7.1
Of which other mussels	198.8	266.7	352.2	320.2	256.0	268.7	249.3	278.8
- China	49.7	55.7	59.5	102.1	96.2	65.9	67.2	74.8
- South Korea	72.1	86.6	109.7	76.1	45.3	96.6	70.4	78.4
- Southeast Asia	27.5	78.0	117.1	99.0	70.2	67.2	45.8	68.3
of which - Thailand	26.4	76.9	116.7	97.3	67.0	63.1	39.6	55.3
- the Philippines	1.1	1.1	0.4	1.7	3.2	3.0	3.3	10.8
- New Zealand + Australia	2.2	1.7	2.3	0.8	0.8	1.2	2.4	2.3
- Mediterranean	6.2	4.9	5.4	4.9	5.2	7.5	10.9	11.1
- Soviet Union	7.4	8.4	8.8	8.4	8.1	13.4	14.2	14.7
- Chile	21.4	17.4	28.5	14.3	15.9	18.4	22.2	16.3
- Peru	9.8	11.9	16.4	11.3	13.7	13.2	13.9	10.5
- Other South + Central America	0.6	0.6	0.9	0.4	0.3	0.5	0.5	1.0
The Netherlands 1)	98.7	112.1	73.3	109.3	118.5	97.4	77.0	109.4
Dutch share of world supply	20	19	12	17	21	16	12	17
Dutch share of world Mytilus edulis supply	34	35	28	36	38	31	21	29
Share of Mytilus edulis in world supply	59	54	42	49	55	54	60	58

1) Landed weight according to FAO definitions (supply weight x 1.15)

Source: FAO

Table 2.2 (cont'd)

82	83	84	85
752.4	737.8	716.9	708.8
444.7	409.4	397.8	402.7
433.6	394.7	384.5	386.6
11.3	14.7	13.3	16.0
307.7	328.4	319.4	306.1
85.5	90.1	94.0	101.0
53.2	51.3	36.6	58.0
108.6	113.7	114.1	87.5
98.4	91.7	93.3	61.3
6.5	19.0	20.8	26.2
6.2	8.7	11.0	11.3
13.6	11.0	9.8	19.9
14.2	14.8	10.8	4.9
11.8	13.6	17.7	17.2
12.2	5.3	6.2	4.7
0.9	0.2	1.1	1.6
130.3	119.6	69.1	116.2
18	16	10	16
29	29	18	29
59	57	55	57

In the last few years the mussel supply in the Philippines and New Zealand has more than quadrupled. A study (Anon 1984) rates the potential for a further increase in supply and sales as high. A potential production figure of 500,000 tonnes was quoted, the 1984 figure being just under 100,000.

Some experts also consider it very likely that the world mussel supply will increase. Various FAO reports (1984a and 1986a) consider that production capability is not the major stumbling block to an increase in the supply. Rather the greatest problem is acceptance of the mussel by consumers.

Nevertheless sufficient problems can be expected in the future in production such as pollution and a lack of space in coastal waters.

2.2 The Western European mussel supply

As indicated in Table 2.2, the past decade has seen an increase not only in the total world mussel supply but also in the Western European supply. It is interesting to note that in the past several years other countries besides the Netherlands, Spain and France have become major contributors to the Western European mussel supply. West Germany and Denmark in particular have experienced a marked increase in their mussel supply (see Fig 2.1).

The Spanish mussel supply is not included in Fig 6.1 since the mussel supply figures as submitted to the FAO may be incomplete. According to FAO statistics the Spanish mussel supply fluctuates around 100 million kg, which is about as high as the Dutch figure. According to other sources (P Salz and JGP Smit 1986a) the Spanish supply is much higher, namely around 240 million kg.

2.2.1 Spain

Most of the mussels in Spain are grown on the northwest coast, in Galicia. The irregular coastline with its huge estuaries (rías) provides good natural conditions for the mussels, which are grown with the aid of rafts from which ropes are suspended, the mussels attaching themselves to the ropes. The number of rafts has remained fairly constant at around 3,300 since 1976 (P Salz and JGP Smit, 1986a). No new permits have been issued since that time since the food supply for the mussels is too scant. There are even indications that the number of permits will have to be reduced by 500 in the future.

The construction costs for a raft are about Dfl.120,000. Every mussel farmer, besides having one or more rafts, possesses a boat about 15 m long to transport the harvested crop. The annual production per raft varies from 400 tonnes of large mussels intended for direct consumption to 1,000 to 1,500 tonnes of small mussels for preserving.

The total mussel supply in Spain is estimated at about 2.4 million tonnes. Of this amount 1.3 million tonnes are processed for preserving and 1.1 million tonnes are intended for direct consumption and sold to the freshwater stations, where they are cleaned and depurated. Fresh mussels intended for direct consumption are required by law to undergo decontamination owing to the frequent bacteriological pollution. The mussel preserving industry, which processes the mussels into canned products (about 80%) and deep-frozen products (20%), exports to West Germany and, to a lesser extent, France and Britain. The fresh mussels are intended mainly for the domestic market. Approximately 200,000 tonnes of mussels are exported to France and Italy. Venus's shells are taken back from Italy as return cargo.

Table 2.3 Some Spanish mussel prices (August 1984)

Type of mussel	Price (ptas/kg) 1)
Fresh mussels for direct consumption	
- Large	63
- Medium	54
- Small	45
Mussels for preserving	
- Medium	38
- Small	25

1) In 1984: 1 pta = Dfl.0.02

Source: P Salz and JGP Smit, 1986a

Since 1981 prices have been established annually through negotiations between mussel farmers' organizations and representatives of the freshwater stations and mussel preserving industry.

The buyers (freshwater stations and mussel preserving industry) announce daily the quantities and qualities they wish to receive the following day. The fishery organizations (associations) then determine which mussel farmers can deliver. Mussel deliveries by the growers take place by rota, the quantity to be delivered being dependent on the production capacity. The administration and receipt of payment also occurs by means of these cooperatives. This system of regulating the supply and demand is very reminiscent of the system of "standard capacity figures" applied in the Netherlands in 1968. Although a limited amount of evasion is likely to occur, the overall system seems to function quite well.

The Spanish mussel differs quite a great deal from the Dutch

mussel in terms of size, colour and taste. The Spanish mussel is an orangy yellow and has a stronger taste. Certainly in the case of fresh mussels, substitution of Spanish mussels for Dutch mussels and vice versa will not readily take place, therefore. This does not seem to apply as much with processed mussels given the rapid growth in exports to West Germany.

2.2.1 France

By far the largest proportion of France's mussel supply comes from the Atlantic coast. Several different techniques are used to harvest the mussels. The major and characteristic production method is the bouchot system, or post culture, where the mussels are grown on posts that stand in the water. The seed mussels are collected on long ropes suspended in the water, which are subsequently wound around the posts. This cultivation method produces a fairly small mussel with a high live weight. A major advantage of this method is that the mussels can be harvested free of sand. It is a rather labour-intensive system, however, and this is one reason why there have been recent attempts to find a way of further mechanizing the harvest. The first major cultivation area using the bouchot system was the Charente Maritime with La Rochelle as its centre. Later bouchot farms were started on the north coast of Brittany (Saint-Brieuc and Saint-Malo) and Normandy. The south coast of Brittany (adjacent to the Charente Maritime cultivation area) in particular has experienced a substantial increase in the supply in the past decade.

The bouchot mussel is not regarded as a single homogeneous product by the French consumer. The markets usually make a distinction

as to area of origin. Moreover imported mussels (particularly from Ireland and Britain) are marketed as bouchot mussels in France. Sometimes they are put back in a French farm to give them more of a French appearance and French flavour.

Besides post culture, the French use bottom culture (mainly in Southwestern Brittany), albeit on a more limited scale.

In the latter half of the seventies large-scale mussel fishing was begun in wild beds in Normandy. Through overfishing in these natural mussel beds the mussel supply took a temporary dramatic rise (see Table 2.4). After 1982 the production figures fell considerably.

Table 2.4 French mussel supply (in thousands of tonnes)

Year	Bouchot mussels, of which La Rochelle	Northern Brittany	Other bouchot mussels	Bouziques	Other mussels 1)	Total mussel supply
1973	150	120	60	156	120	606
1974	152	61	64	101	106	484
1975	182	116	44	66	142	550
1976	70	125	83	79	85	442
1977	90	145	116	62	117	532
1978	99	205	37	54	89	484
1979	86	189	84	54	206	619
1980	85	195	78	55	314	727
1981	102	183	100	56	369	810
1982	76	154	117	37	325	709
1983	82	135	123	2	136	478
1984	66	106	190	36	117	515
1985	-	-	-	-	-	607

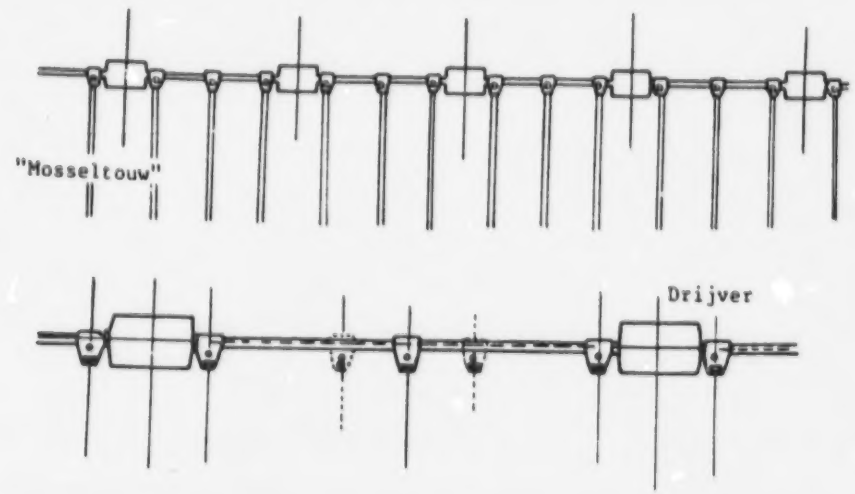
1) Overall Atlantic coast bottom culture mussels, suspended culture mussels and wild mussels

Source: Statistiques des Pêches maritimes (Ocean Fishery Statistics)

In addition to overfishing in the wild mussel beds, in recent years there have been problems with all kinds of diseases and infections. This partly accounted for the much lower Atlantic coast supply (bouchot and other mussels) in 1984 than had been recorded for the period around 1980. The decline in production was a major reason for initiating a great variety of research projects to increase the supply. In Normandy and Brittany, for instance, trials were conducted with the suspended culture system, where ropes suspended in the water are kept afloat by means of barrels (see Fig 2.2).

Experiments are also being carried out at present with the cultivation of a new type of mussel, a hybrid form of the common mussel, or Mytilus edulis, and Mediterranean mussel, or Mytilus galloprovincialis.

Fig 2.2 Mussel culture according to the longline system



Mosseltouw = rope
Drijver = float

Besides the Atlantic coast mussel supply, mussels are cultivated on the Mediterranean coast, albeit in relatively smaller quantities. By means of the raft system (suspended culture) mussels are grown in the Bassin de Thau. These mussels, known as "bouziques", strongly resemble Spanish mussels in appearance and taste. Here too, however, there have been problems with a declining supply in recent years although possibilities for increasing the supply are being recognized, if only to replace the mussel imports from Spain. Substitution of imports for domestic production is a major objective in overall French fishery policy.

2.2.3 West Germany

West Germany, which like the Netherlands uses bottom culture, has two major mussel fishing areas: on the North Sea coast of Schleswig-Holstein behind the North Frisian Islands (roughly from Husum to the Danish border) and on the coast of the State of Lower Saxony, on the East Frisian tidal flats, in Jade Bay and in the Eastern Ems between Germany and the Netherlands. A fairly small quantity of mussels are also produced on the Baltic Sea coast.

The cultivation of mussels, ie. use of the process of relaying seed mussel and spat to culture sites, is not as widespread as it is in the Netherlands. In 1984 some 30% of the mussels produced in Lower Saxony and about 50% of those produced in Schleswig-Holstein had been grown on culture sites (Das Fischerblatt 1985a). Farming mussels on protected sites did not become possible until after 1974, when there was an appropriate change in the legislation. Previous to that time any German could fish in open waters. With the enactment of the

"Bundeswasserstromengesetz", which also regulates the protection of mineral resources, it became possible to mark out sites for mussel fishing. In the past few years in particular a number of new sites have been provided with the arrival of several Dutch subsidiaries (around 1982). These sites were requested partly in order to start mussel farms and partly to safeguard the supply (an important reason for German businesses). The areas outside the sites remain open to all fishermen as long as the other provisions of the German fisheries legislation are adhered to.

The mussels from wild, natural beds are landed by both mussel fishermen themselves and shrimpers. For the latter, mussel fishing is usually only a sideline. Only in years with low shrimp summations or good market prospects and prices for mussels do shrimpers go in for mussel fishing on a large scale. In 1984 approximately 30% of the mussel supply in Lower Saxony came from shrimpers. The overall German mussel supply has grown rapidly in the last five years. The 1984 mussel supply figure was 593,000 tonnes as against 122,000 tonnes in the seventies.

Table 2.5 West German mussel supply (in thousands of tonnes)

Year	Lower Saxony	Schleswig-Holstein	Baltic Sea	Total
70-79 (avg)	52	67	3	102
80	20	83	5	108
81	46	59	2	106
82	52	118	0.2	160
83	110	206	0.1	316
84	247	346	0.0	593
85	54	155	0.0	209

Source: Jahresbericht des Fischereiamtes Kiel und Bremerhaven

The growth in the supply was largely the result of improved market opportunities due to the increased demand from the Netherlands. In 1984 approximately 60% of the total supply was exported to the Netherlands.

The sharp rise in the supply was partly attributable to overfishing in the natural mussel beds. As a result of this excessive action and because of the severe 1984/85 winter, the supply dropped sharply in 1985. As far as that is concerned the German supply is at least as susceptible to unfavourable natural conditions (eg. storms and ice flows) as is the mussel supply from the Dutch tidal flats, especially since a large proportion of the mussels originate from the wild, natural beds. In 1979, for instance, as a result of the previous harsh winter the supply declined to no more than 34,000 tonnes.

A more structural contribution to the growth in the supply has been provided by the establishment in Schleswig-Holstein of a number of Dutch businesses that export mussels to the Netherlands. Two of these businesses, subsidiaries of Dutch mussel preserving enterprises, also operate their own boats for mussel fishing. In addition a Dutch mussel cookery has been set up in this area; it exports cooked mussel meat to the Netherlands. This mussel meat is used as a semi-processed product for preserved products made by the parent company in the Netherlands.

The extent to which the German supply will maintain its current higher level depends in large part on the market situation in the Netherlands. Nevertheless, as a result of the investments made by

Dutch businesses in Schleswig-Holstein, the supply will not decline as much as it did before if there is a higher supply or lower demand in the Netherlands. In 1985 a substantial quantity of mussels was imported from West Germany in spite of a relatively high supply in the Netherlands. Moreover the Germans are now less dependent on their natural mussel beds because of the more extensive use of mussel culture by Dutch businesses. The mussel supply in Schleswig-Holstein saw a relatively sharper decline in 1985 than did the supply in Lower Saxony. With the growth in the supply and the importance of mussel fishing in West Germany, the rules seem to be somewhat stricter now. The opening of the fishing season, which lasts from 1 August to 31 May, is more closely observed. On the other hand there is some criticism, particularly from the Dutch government and fishery associations, regarding control of the bacteriological and phytosanitary quality of the mussels and water in the fishing area. In the autumn of 1986 the heavy algae growth on the German tidal flats gave rise to a number of problems.

On the other hand the establishment of the Wattenmeer National Park may place limitations on mussel fishing. Although the existing extension will not be interfered with, a further extension in the future is not anticipated partly because of the problems it would create in terms of nature conservation.

2.2.4 Denmark

The Danish mussel supply increased significantly in the seventies. The 1980 supply figure was around 900,000 tonnes as against 270,000 tonnes in 1973. Although the supply has fallen somewhat since, it is

still at a substantially higher level than it was ten years ago.

Table 2.6 Danish mussel supply (in thousands of tonnes)

Year	73-75 (avg)	76	77	78	79	80	81	82	83	84
Supply	279	379	476	468	567	904	861	695	665	814

Source: FAO

Until recently, by far the greatest proportion of mussels were harvested in Lim Fjorden. These mussels, which according to the markets are tougher than the Dutch mussel, are almost all processed by the Danish mussel preserving industry. In 1986 mussels from this area were exported to the Netherlands. It is possible that their toughness has to do with the mussels' great diversity in age (they are fished off the natural beds). In addition Lim Fjorden has pollution problems caused by too high a concentration of heavy metals.

According to 1977 statistics a small quantity of mussels are also obtained from the Little Belt. Given the reports concerning the problems with the businesses in this area (Anon, 1986) production will probably not be very high.

Owing to a change in the Danish fisheries legislation it has been possible for the last couple of years to fish mussels on the tidal flats bordering on Germany. These mussels are fished by the subsidiaries of Dutch enterprises. A mussel cookery has even been established on the island of Rømø. There have been recent reports, however, that the Danish government wants to slow down the growth of mussel fishing in this area.

The quality of the mussels from this area seems to be very similar to that of the German mussels and hence less tough than the Lim Fjorden mussels. Concrete figures concerning production in the area are not available. We do know that imports of Danish mussels have increased considerably (289,000 tonnes in 1984). It is interesting to note that imports from Denmark are shown to be much higher by Dutch statistics than are exports to the Netherlands as indicated by Danish statistics (228,00 tonnes in 1984). This is perhaps indicative of the scope of Danish mussel production. Imports of Danish mussels into West Germany have also increased significantly (to around 100,000 tonnes in 1985). It is possible that a large part of these imports is intended for further shipment to the Netherlands via the Dutch subsidiaries in Schleswig-Holstein.

2.2.5 Britain

As with the Netherlands, Britain has to cope with large fluctuations in the supply. As a result of natural causes and temporary, heavy overfishing, the supply may vary considerably (see also JGP Smit, 1977a). Compared with the producers discussed earlier, the supply is rather low.

Table 2.7 British mussel supply (in thousands of tonnes)

Year	73-79(avg)	80	81	82	83	84	85
Supply	71	91	25	44	59	43	58

Source: FAO

The mussel supply comes from three main areas: in The Wash, on the east coast of England, in the Exe and Teign estuaries in Cornwall, and in northern Wales. Nearly all the mussels originate from wild beds. Recently experiments were begun with the relaying of seed mussels in the wake of Dutch successes with this method of cultivation. For the time being the method is being operated on a small scale and in a fairly primitive fashion. The mussels produced are wholly free of sand and according to the French markets have a taste that closely resembles that of the French bouchot mussel. Attempts have been made for quite some time to modernize and upgrade the British mussel fishing industry. Several initiatives have already been undertaken by the SFIA (Sea Fishing Industry Authority). Developments have been slow up to now, partly because of the sometimes scant enthusiasm for the plans on the part of the mussel fishermen.

In the area of The Wash bottom culture was recently started with appropriate caution being exercised. Until a short time ago there had been some problems with bacteriological contamination of the water. Partly at the request of a French mussel importer from St-Malo a purification plant was therefore set up in which mussels are treated with water subjected to ultraviolet rays. Its capacity, at 200 tonnes a week, makes it the largest purification plant in Britain. The mussels are shipped from Portsmouth, in the south of England, to France. In the future the British want to try to market more mussels in the south of England. There have also been exports to the Netherlands in years when the Dutch mussel supply was meagre. Recently a Dutch-British enterprise was established to market mussels, cockles and shrimps.

In northern Wales a mussel cleaning plant has been in operation

for four years. It processes mussels from the entire United Kingdom and Ireland. The plant also operates a former Dutch mussel boat, which harvests mussels grown by the bottom culture method. The great majority of the mussels (currently 12,000 mussels produced; 50,000 tonnes planned for the future) are sold in the southeast of England in 2 kg packaging that is also used in the Netherlands. The extent to which the British mussel supply can increase depends largely on how successful the technical improvements will be. The problems with the polluted coastal waters may in some cases be a hindrance. Although British fisheries policy is based primarily on import substitution, it is quite possible that most British mussels will appear on French, Dutch or other foreign markets.

2.2.6 Ireland

The past few years in particular have seen quite an increase in the Irish mussel supply.

Table 2.8 Irish mussel supply (in thousands of tonnes)

Year	73-79(avg)	80	81	82	83	84	85
Supply	33	46	47	53	57	126	104

Source: FAO

The mussels are farmed using both bottom culture and suspended culture. Wexford, on the east coast, uses mainly the bottom culture method while Clew Bay and Bantry Bay, on the west coast, grow their mussels using longlines and rafts (suspended culture). About 90% of the

production comes from bottom culture.

Interest in mussel farming has grown significantly in recent years. A budget has been made available for research into raft culture, which is already being operated with a reasonable degree of success. In addition trials are currently being conducted with a new type of mussel from the United States. This species, which is a cross between a clam and a mussel, is said to be more resistant to pollution. It is likely that Ireland too has problems with pollution of its seawater. The government's initial objective to achieve a mussel supply of 100,000 tonnes by 1990 has already been reached. A mussel processing enterprise (Lett & Co) in Wexford has been expanded and modernized with government and EEC support. The plant processes cockles and scallops besides mussels.

Most of the mussels, especially the smaller ones, are exported to France, where they are readily sold as bouchot mussels after freshwater treatment (see also 2.2.2). In addition attempts have been made to export more mussels to the Netherlands. Only in the 1984/85 season, when the Dutch supply proved to be low, did these attempts meet with a reasonable degree of success. The high cost price of Dfl.1.00 at the wholesale level is a major problem in this respect (se Harmsma, 1985a).

3. The market supply of mussels in the Netherlands

3.1 Schematized overview of the various commercial trends

Overall commercial trends have seen a number of changes in the past few years. On the supply side imports in particular have increased while on the demand side sales of preserved mussels, deep-frozen mussels and cooked mussels have risen sharply.

Fig 3.1 shows how the various figures on supply, imports and sales relate to each other. Differences arise between total sales and the total supply of mussels because of losses through freshwater treatment and cleaning, when silt, sand and broken and dead mussels are removed.

When the mussels are processed for preserving etc. there is an additional weight loss through removal of the shell. Once processed, however, an increase in weight is registered as a result of the addition of a variety of products such as vinegar and vegetables. Because many mussel processing businesses combine more than one activity and both fresh and processed mussels are sold on the market, a proportion of the mussels for the processing industry may just as easily be used for direct consumption (according to the statistics of the PVV)* Depending on the demand, a shift in the other direction may also occur. In a number of cases the statistics in this report may therefore differ slightly from those of the PVV.

1) The net supply is equal to the gross supply minus the quantity of mussels taken by the Mussel Fund. Along with the imported mussels

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* PVV = (prob.) Fisheries (Control) Board. Revisor.

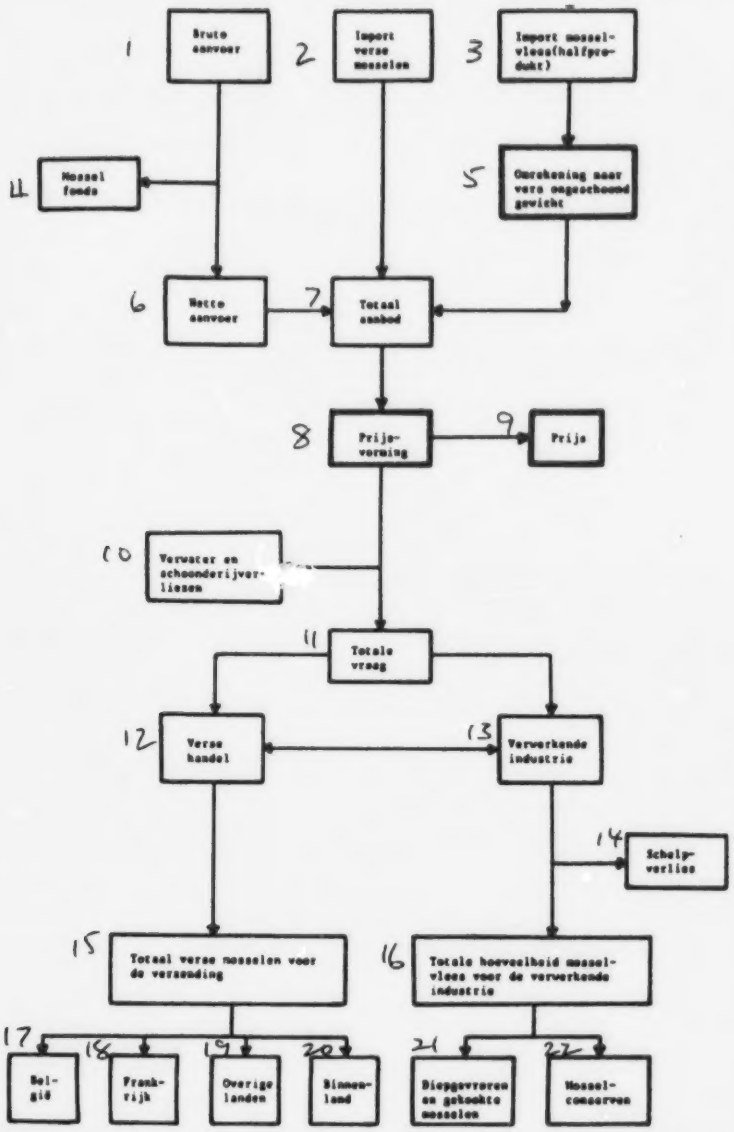
this makes up the total supply that becomes available for the Dutch market. As used in the PVV statistics, this total supply is expressed in gross product weight. The mussel imports consist of both fresh mussels and mussel meat (semi-processed products) converted into gross product weight.

3.2 Development of the total supply

The Dutch mussel supply has always been very precarious. The gross supply has fluctuated from 667,000 tonnes in the 1984/85 season to 1,584,000 tonnes in the 1982/83 season. The mussels produced in the Waddenzee, in particular, have proved to be rather susceptible to changes in natural conditions. The mussel supply from Zeeland waters is much more constant. The highest production level since the institution of the Mussel Fund was 1.4 times as high as the level in the season of lower output (4.4 times as high in the case of the Waddenzee).

Despite the operation of the Mussel Fund the net supply has also continued to fluctuate a great deal. If we examine the five-year progressive average we note that there is no clear trend in either the gross or the net supply. Even if we use correlations we cannot distinguish any significant trend in the supply figures. Moreover government policy is not directly aimed at achieving an increase in the supply. As regards mussel production in both the Waddenzee and the Eastern Scheldt the government's objective is to maintain current levels as much as possible, bearing in mind nature conservation requirements.

Fig 3.1 Schematic overview of the market for mussels and mussel products



1 Gross supply
2 Fresh mussel imports
3 Imports of mussel meat (semi-processed product)
4 Mussel Fund
5 Conversion to gross product weight
6 Net supply
7 Total supply
8 Price forming
9 Price
10 Losses through freshwater treatment and cleaning
11 Total demand
12 Fresh mussel market
13 Processing industry

14 Shell weight loss
15 Total fresh mussels for shipment
16 Total mussel meat for the processing industry
17 Belgium
18 France
19 Other countries
20 Domestic
21 Deep-frozen and cooked mussels
22 Preserved mussels

Unlike the supply, fresh mussel imports have risen appreciably. In the last few seasons in particular mussel imports have increased dramatically. In the 1984/85 season the level of imports was only a little lower than was the Dutch supply level. In earlier seasons with a low supply level (eg. 1980/81) mussels were also imported but not in such large quantities. The major countries exporting to the Netherlands are West Germany and Denmark. Imports from those countries easily account for the bulk of Dutch imports. Besides fresh mussels, an increasing amount of cooked mussels (semi-processed product for the mussel preserving industry) are being imported.

Table 3.1 Dutch imports of fresh mussels (in thousands of tonnes)

Origin	Year					
	1980	1981	1982	1983	1984	1985
West Germany	49	24	10	154	304	91
Denmark	29	4	0	72	283	246
Other countries	18	4	1	1	5	18
Total imports	95	33	12	227	592	355

Source: Eurostat

The great increase in imports was largely the result of initiatives undertaken by Dutch traders in West Germany and Denmark

(see 2.2.3 and 2.2.4). Improved market prospects also played a major part.

The greatly fluctuating supply and the high market prices around 1980 weakened the competitive position of the processing industry somewhat. Through large imports of mussels it was possible to ensure the continued supply of raw materials at a significantly lower price. Prices for mussels from Schleswig-Holstein and Denmark were often found to be far below the Dutch supply prices. The discrepancy was less in the case of mussels from the Weser-Ems region.

Table 3.2 Supply prices in the Netherlands, Lower Saxony and Schleswig-Holstein in guilders per tonne of mussels (deflated; 1985 guilders)

Origin	Year					
	1980	1981	1982	1983	1984	1985
Netherlands[1)]	105	11	37	42	51	51
Lower Saxony	55	45	43	37	31	40
Schleswig-Holstein	46	28	20	18	15	30
Denmark[2)]	11	11	.	19	24	29

1) Dutch figures for seasons 1980/81 to 1985/86

2) Import prices not directly comparable with supply prices

Source: PVV, Jahresbericht des Fischereiamt Bremerhaven und Kiel, Eurostat

The lower supply prices apparently compensate sufficiently for the higher transportation costs caused by the longer distance to Yerseke. The bulk of the mussels are imported by truck. A smaller amount are brought in by ship.

The increase in imports also resulted in a slower rise in the production prices for mussel farmers than had been the case in seasons with a low supply (compare the 1984/85 season with that of 1980/81). As a result of the lower supply, prices even rose to such levels that higher production (summations) could be achieved than had been obtained in seasons with a lower supply.

The lower susceptibility of prices to fluctuations in the Dutch supply is also indicated by the flexibility estimates. For the period 1967 to 1977 the estimated flexibility was 1.05 (JGP Smit 1979a). This implies that a 10% decline in the supply gives rise to a 10.5% higher price. For the period 1969 to 1985 the flexibility estimate dropped to 0.95.

Unlike the seventies, today a higher supply will often ensure higher total production for the mussel farmers, although price making has now become largely dependent on imports and hence also, indirectly, on supply trends abroad (especially in West Germany and Denmark). A poor supply in both the Netherlands, West Germany and Denmark, as was the case in the 1986/87 season, can still result in considerably higher production for the mussel farm. On the other hand the summation can turn out very low if there is a low supply in the Netherlands and a high supply abroad. In the 1984/85 season this situation led to a supply value of only 33 million guilders.

Another effect of the increase in imports was that the total supply of mussels could for a number of seasons be maintained at a substantially higher level than had been possible in previous years. Even in the 1984/85 season, when the supply was very low, the total

supply was still considerably higher than was the average level in the 1975 to 1980 seasons. For the mussel trade and processing industry expansion of the mussel supply meant not only that the markets could be maintained in spite of a low Dutch supply but also that sales could be increased. In addition to the expanded supply there were other factors that had a positive effect on the sale of mussels (see Chapter 4).

Table 3.3 Net supply, total market supply (in millions of kg), supply value and market supply value (in millions of guilders) of mussels in the Netherlands

Seasons	Net supply	Net market supply 1)	Supply value 2)	Supply value 2)
70/75(avg)	88.8	92.0	35.7	37.0
75/80(avg)	87.8	96.0	49.7	52.8
80/81	67.0	76.3	70.6	76.0
81/82	100.0	101.0	38.4	39.0
82/83	115.7	120.4	41.9	44.1
83/84	98.0	137.3	41.6	54.5
84/85	64.5	126.0	33.2	54.5
85-86	106.0	146.0	54.2	70.2

1) Including imports of mussel meat (semi-processed)
2) Value in 1985 guilders

Source: PVV, Central Statistical Office (CBS)

Ultimately the expanded supply has also improved the prospects of Dutch mussel farmers. In the 1985/86 season, in spite of fairly high imports and the higher Dutch supply, slightly higher prices could be achieved, which meant a considerable rise in the total summation. The Mussel Fund, too, has virtually stopped accepting mussels in the past few seasons.

4. The mussel market

Not only did the supply increase, but, as expected, so also did mussel sales. In the last few years in particular sales have risen dramatically. Average sales for the 1983/84 to 1985/86 seasons came out about 33% above the average for the 1970/71 to 1975/76 seasons. Nevertheless, as a result of increased losses through cleaning and freshwater treatment the increase in sales did not keep pace with the increase in the supply (a 47% increase).

A major reason for the increase in losses from cleaning and freshwater treatment is the wider use of the smaller 2 kg "consumer packaging", which requires higher standards for the mussels. Some of the other reasons given are the lifting of the maximum silt percentage in 1967, increased imports (higher losses) and the introduction of larger ships, giving rise to more shell breakage (eg. through the greater drop height and deeper layering in the hold).

As a result of high prices and a meagre supply, sales of mussels had declined somewhat by the end of the seventies. Sales of processed mussels in particular were down considerably. Since then sales of processed mussels and, to a lesser extent, domestic sales of fresh mussels have increased. Besides the expanded supply and the lower cost of raw materials, investments in the commercial and processing sectors have done a great deal to boost sales. After the future of the Eastern Scheldt became clearer there was a more secure basis for pursuing business activities. Moreover some of the businesses had to be moved when the dykes were built up near Yerseke.

4.1 The market for fresh mussels

By far the largest proportion of fresh mussels are still being exported to Belgium and France. Although fresh mussel consumption in the Netherlands has grown it has not yet managed to reach comparable levels. Aside from these traditional markets, virtually no fresh mussels are exported. Exports to "other countries" account for only 2 to 4% of total fresh mussel exports. Most of these mussels are sold in West Germany. Very small quantities are exported to other countries on an ad hoc basis only, the main problem being the duration of shipment and the consequent freshness of the mussels. Shipment and distribution costs may also be obstacles to the building of new, farther-flung markets.

Table 4.1 Losses through cleaning and freshwater treatment (in % of total supply), total sales, domestic consumption, exports, and purchases by the mussel preserving industry (in thousands of mussels, net product weight)

Losses through cleaning and freshwater treatment (%)	70/75(avg)	75/80(avg)	80/81	81/82	82/83	83/84	84/85	85/86
	26.8	33.3	31.1	28.0	29.7	34.2	36.1	33.0
Fresh mussel sales:								
Domestic	39	71	76	89	98	105	97	112
Belgium	205	242	234	272	317	310	243	305
France	314	187	127	229	265	234	183	208
Other countries	7	9	9	28	20	13	8	28
Total fresh mussel sales	565	509	446	619	700	662	531	653
Purchases by the mussel preserving industry 1)	109	110	87	108	147	241	279	330
Total sales	674	619	533	727	847	903	810	983

1) Estimate
Source: CBS, PVV

A common condition for the development of almost all the markets has been the availability of sufficient mussels (see Appendix 1). The quality of the mussels, though difficult to quantify, also appears to affect market potential. Improved quality control in both supply and processing is a longer term need. In the short term, when there are temporary shortages a lower quality mussel than would be desirable often appears on the market.

4.1.1 The Netherlands

The mussel market in the Netherlands has been very successful in the past fifteen years. The rise in the consumption of mussels seems to be largely trend related (see Appendix 1). Any connection between the availability of mussels (the indicators being supply and domestic production) and domestic consumption is seen to be much less important. The effect of the market price was found to be virtually negligible.

The trend related growth of mussel consumption in the Netherlands is the result of a number of factors. Firstly consumers have developed a more positive attitude towards fish in general and towards new and exotic products. Secondly in the last few seasons in particular a great deal of interest has been generated in the mussel following the joint promotional campaigns of the commercial enterprises. Thirdly the greater variety in the fish retailer's stock has obviously also contributed to the increase in consumption.

In spite of the growth in the past few years there are still large groups of consumers who never or hardly ever eat mussels. A

study undertaken by Horjus (1983a) showed that only 20% of customers at fishmongers' regularly buy mussels. Since not every consumer regularly buys fish by any means, the real percentage of mussel consumers is probably higher. The fact that many consumers are unfamiliar with the product is a major reason for their not buying it.

There are great discrepancies in the volume of mussel consumption between the various regions. In the western part of the country some 47% of the population buy almost 78% of the total volume on the domestic market. In the north and east mussel consumption seems to be substantially lower. Among the possible causes of this lower consumption level are an inadequate distribution system and unfamiliarity with the taste of the mussel. In terms of distribution there are two major problems. Firstly the number of fish retail outlets per 100,000 inhabitants is significantly lower than it is in the west of the country. This is also connected with the fact that a true "fish mentality" is largely lacking in these areas. Moreover, on account of the lower demand, fish retailers in the north and east have not included mussels in their stock as often (see, eg., Horjus, 1982a and Niks, 1985a).

In addition consumption may be impeded by the lack of a proper transportation network for mussels. Because fresh mussels do not keep too long it is very important that they be shipped and distributed rapidly. Owing to the small market in these regions, however, it is not often an attractive proposition to establish a separate distribution line. Outside the west fresh mussels are more often bought through nonspecialized wholesalers (Niks, 1985a). This means an additional link in the distribution chain, which perhaps does not

always have a favourable effect on the quality. In the summer months in particular, although fewer mussels are sold then, a mussel's fresh life is often rather limited in spite of refrigeration.

Table 4.2 Mussel sales in the Netherlands broken down by region 1)

Region	Percentage of total population	Percentage of total number of fish retail outlets	Percentage of domestic mussel sales
North	8	8	2
East	23	17	4
West	47	63	78
South	22	12	14
Total	100	100	100

1) Regional divisions: North - Provinces of Groningen + Friesland
East - Provinces of Drenthe, Overijssel + Gelderland
West - Provinces of Utrecht, North Holland South Holland + Zeeland
South - Provinces of North Brabant + Limburg

Source: Horjus, 1983a

Retailers are not always very satisfied with the quality of the fresh mussels. Seventy percent of retailers sometimes complain, broken shells, sand in the mussels and lack of freshness being the most common complaints (Horjus, 1982a).

In the last few years, however, the processing plants seem to have been paying more attention to quality through improved separation techniques, depuration and by other means. Nevertheless when there are temporary shortages poor quality mussels still frequently find their

way onto the market. On the other hand wholesalers have been known to complain that the retailers keep the mussels too long.

Quality control is gaining in importance and, because consumers are becoming increasingly critical, will receive more and more interest in the future. A manifestation of this trend is the recent regulation requiring the date of packaging to be shown on the product.

4.1.2 Belgium

Exports of fresh mussels to Belgium have also developed favourably in recent years (see Table 4.3). After a trend-related rise in exports, a connection can be observed with the availability of mussels (the indicator being the Dutch supply).

Partly because of the favourable location, the Netherlands controls virtually the entire Belgian market. Only occasionally, in situations of scarcity, are mussels imported from other countries (mainly Denmark).

Table 4.3 Belgian mussel imports (in thousands of tonnes)

Origin	Year					
	1980	1981	1982	1983	1984	1985
Netherlands	226	279	313	306	270	301
Denmark	5	7	4	2	10	2
Total	233	287	318	309	282	306

Source: Eurostat

Partly because there is no direct competition from other countries, the Belgian market is not very responsive to price trends. The extent to which this will continue in the future depends partly on the trend in direct imports from other countries. At the beginning of the 1986/87 season Belgium sold Danish mussels on a somewhat larger scale than had previously been the case. Owing to the very high Dutch mussel prices it apparently became attractive for the Belgian fish retail sector to import Danish mussels as well. The selling prices of the Dutch mussels were sometimes almost twice as high as those of the Danish mussels (consumer price for Dutch mussels Dfl.5.50 per kg, for Danish mussels Dfl.3.00 per kg). The majority of the buyers, ie. restaurants and fish retailers, still seem willing, however, to pay a higher price for the often better quality and fresher Dutch product. For the Belgian consumer mussels are an almost indispensable part of the diet. As with young herring in the Netherlands, the first-of-the-season ethos plays an important role here. Consequently mussel exports to Belgium start early in the season.

In recent years Belgium has seen ever increasing concentration in fish distribution. Sales through the general foodstuffs sector - eg. supermarkets and hypermarkets - have increased sharply in the past few years. In the last 10 to 15 years or so more and more supermarkets and hypermarkets have begun selling fresh fish. Often fresh fish is used as a "bait" to lure more customers. As a result of the increased competition from the general foodstuffs industry a number of fish retail outlets have disappeared in the past few years.

A certain amount of concentration has also taken place within the specialized fish retail sector. The appearance of a solid chain

of fish shops seems to be accelerating the redevelopment process.

As a result of this increasing concentration Dutch mussel marketing businesses will be dealing with ever fewer clients. This will allow Belgian fish dealers to strengthen their market position in relative terms so that the various exporters can be played off against one another more easily.

4.1.3 France

The competitive position of Dutch mussels in France is quite different from that in Belgium or the Netherlands. Although there is quite a significant domestic supply, mussels are also imported from other countries.

The French market can be subdivided according to a number of different criteria. One classification system is based on the different varieties of mussel. Mediterranean market mussels comprise mussels from the south of France and mussels imported from Spain. Most of these mussels are intended for the market in the south of France. A smaller proportion of this variety is sold in Paris. In recent years, however, the southern French mussel supply has declined, so that other varieties of mussel are also marketed when this is possible.

The market for northwestern European mussels is considerably larger. It consists of domestic supplies from the Atlantic coast (Normandy and Brittany) and imports mainly from the Netherlands, Ireland and the United Kingdom. This group can itself be subdivided into the smaller French bouchot mussels and the larger Dutch variety.

The Dutch mussels are often used as the main dish whereas the French bouchot mussels are used principally as starters and side dishes. French mussel dealers and consumers further subdivide the bouchot mussel group according to place of origin.

From the point of view of consumer trends the French mussel market can best be split up into two areas: the north and the rest of France including Paris. Northern France has traditionally been the major market for Dutch mussels. Most of these mussels are eaten with the main course. Because of the relatively short distance to this market - Yerseke is much closer to northern France than are Normandy and Brittany - a strong competitive position has been built up. Improved transportation and distribution in recent years has partly negated this Dutch advantage however.

In the rest of France mussels are much more frequently eaten as starters. Particularly in Paris and the surrounding area Dutch mussels are experiencing more competition from the French bouchot product. French mussel dealers and consumers are often willing to pay a much higher price for bouchot mussels (sometimes twice as much) because they prefer the taste and the higher quality. This quality factor is evident in the lower incidence of shell breakage and in the fact that the mussels keep longer. Since the bouchot mussel is much more of a tidal mussel than is the Dutch mussel, it becomes more "hardened". Another factor contributing to their longer shelf life is the fact that the mussels are not separated from the cluster until they have reached the end of the distribution line. .

Table 4.5 French domestic supply and imports of fresh mussels (in thousands of tonnes)

	Year						
	70/75(avg)	1980	1981	1982	1983	1984	1985
Total supply	416	727	810	709	478	515	607
Total imports	401	276	357	410	425	429	371
Total market volume	827	1025	1167	1129	903	944	978
Common mussel (Mytilus edulis)							
Supply	278	694	754	672	476	477	
Imports from: Netherlands	311	107	194	250	260	222	212
Ireland	3	2	3	11	21	68	29
UK	11	41	1	16	31	29	33
West Germany	8	17	26	4	2	5	0
Denmark	1	1	21	3	0	7	8
Total market volume	612	862	999	956	789	808	
Mediterranean mussel							
Supply	138	55	56	37	2	36	
Imports from Spain	66	106	109	119	104	95	89
Total market volume	204	161	165	158	106	131	

Source: Eurostat, Statistiques des Pêches maritimes

In the late seventies and early eighties the French mussel supply saw a temporary sharp increase. Combined with the high Dutch market prices, this led to a marked decline in exports of Dutch mussels to France. This link between exports to France on the one hand and the French supply and Dutch market price on the other hand was also clearly indicated in the estimates according to the simultaneous system of

equations (see Appendix 1). The price elasticity in the period 1969-1985 was -0.89. This means that a 10% rise in the market price would have decreased the export volume by 8.9%. A 10% increase in the French supply would have reduced exports by 5.7%.

Although both the French supply and the Dutch market price dropped after 1980, exports are still far from the level they were at in the early seventies. This can be attributed to a number of causes. As a result of the greater competition on the French market, prices for Dutch mussels are lower than they are on other markets. In this way the French market often becomes a surplus market, where frequently the poorer quality mussels also end up. Through the increased sale of fresh mussels on the domestic market and the rapid growth in sales of processed mussels, the mussel volume has come under increased pressure both quantitatively and qualitatively.

The increasing imports from Ireland and the United Kingdom have caused Dutch exports of fresh mussels to fall behind. Owing to the small size of the Irish and UK mussels they are good replacements for the bouchot mussel once they have undergone freshwater treatment in France. Despite the higher imports of these mussels French mussel dealers still talk about a situation of shortage (Anon 1985a). It is possible that the decline in the total market volume since 1980 was partly caused by this shortage.

The decline in the demand and purchasing power in the north of France may also have had an adverse effect on Dutch mussel exports. This very region where a substantial proportion of Dutch mussels are exported was recently faced with the negative effects of various mine

closures.

Owing to the poorer quality of Dutch mussels available for the French market it may be anticipated that if the French supply recovers, Dutch exports will decline further, especially with the increased competition from Ireland and Britain. The gradual abolition of customs tariffs between the EEC and Spain may result in more competition still.

4.1.4 West Germany

Despite the higher mussel supply in West Germany, domestic markets are not well developed as yet . By far the greatest amount of mussels produced are exported to the Netherlands. According to the German mussel industry domestic sales account for only about 70,000 to 100,000 tonnes (Harmsma, 1985a). The majority of the mussels are marketed in the Ruhr region, where the mussel industry has a number of freshwater treatment plants in which the mussels are cleaned with tap water. There is also a processing plant in Husum, Schleswig-Holstein, which cuts and cleans mussels and packs them in 2 kg packages.

Another indication of the size of the German market for fresh mussels can be obtained from the miscellaneous item in Table 4.7. This item shows higher values than those estimated by the German commercial sector. This discrepancy is probably attributable in large measure to freshwater treatment and cleaning losses. The nascent German mussel preserving industry may also be partly responsible.

Dutch mussel exports to West Germany are rather insignificant and are likely to remain so for the time being. In view of the short

Table 4.7 German mussel supply, imports and exports (in thousands of tonnes)

	Year					
	1980	1981	1982	1983	1984	1985
Supply (domestic productn)	108	106	168	316	590	209
Fresh imports - all countries	69	40	42	37	36	127
Of which Netherlands	8	8	21	12	7	9
Denmark	51	21	10	11	16	106
Spain	6	8	11	10	10	10
Total supply	177	155	210	353	626	336
Fresh and processed exports 1)	69	69	43	230	441	200
Miscellaneous	108	86	173	123	185	136

1) Estimates, converted to fresh weight

Source: FAO, Eurostat

distance, further development of this market could offer favourable prospects. This applies particularly to the market in the Ruhr region. Supply of outlets further inland would be more difficult since these are supplied largely by wholesale businesses operating out of Hamburg and Bremerhaven (JGP Smit, 1984a).

Another problem is that establishment of new transportation lines for small quantities is not usually very profitable. The market would have to become sufficiently large within a reasonable period if start-up losses are to be kept within manageable limits. This problem can perhaps be overcome through the use of joint freight services, eg. in conjunction with other fish dealers.

Other countries that export fresh mussels to West Germany are

Spain and Denmark. It is possible that Spain is exporting more mussels to West Germany now that it has joined the EEC. The high level of imports from Denmark in 1985 most probably relates only to goods which have been dispatched by the Dutch commercial enterprises and are passing through West Germany.

4.2 The market for processed mussels

4.2.1 World trade in processed mussels

The market for processed mussels encompasses a much larger number of countries than does the market for fresh mussels. Because the product keeps almost indefinitely it can be transported more readily over large distances. Nor does it require much special attention in the final stages of distribution, which makes it easier to sell through the nonspecialized retail outlets (groceries, supermarkets and hypermarkets). In spite of the advantages of greater and wider distribution, there are also disadvantages. Large fluctuations in annual production may in some cases cause problems. If a producer cannot deliver his product for an extended period his place will soon be taken by other producers or products. In supermarket and hypermarket systems in particular the struggle for a place on the shelves is quite fierce. Producers can deal with this by retaining sufficient stocks or giving the product such added value that it cannot be easily missed or replaced.

In addition consumers of processed products and especially the retail outlets involved are much less inclined to accept frequent large price increases than in the case of fresh products. Supply agreements with

supermarket chains often cover longer periods - several months to even a whole year. Consequently it is important for producers of processed mussels to judge correctly what prices and quantities may be expected to be profitable.

The various statistics do not include many separate figures for business in processed mussels. In many cases mussel products are covered by the item; preserved forms and preparations of other crustaceans and mollusks. The figures given below are in many cases derived from national statistics or based on estimates.

In 1984 the main producers of processed mussels were Spain, Denmark, South Korea and the Netherlands. The smaller producers are larger in number and include West Germany, France, Ireland and Chile. It is possible that Thailand also produces quite a large quantity of preserved mussels. No indication of the nature and extent of production was provided by any of the statistics however.

Table 4.8 Estimate of the quantity of processed mussels produced in 1984 (processed quantity of mussel meat in thousands of tonnes)

Spain	150-200
Netherlands	ca 70
Denmark	ca 70
South Korea	ca 20

Source: Various national statistics, Institute of Agricultural Economics (LEI) estimates

4.2.2 Spain

Although estimates on the correct production figures vary somewhat, Spain seems to be by far the most important producer. Most of the processed mussels are sold on the domestic market. Only about 10% of the total production, ie. some 5,000 metric tons, product weight, are exported, the major receiving countries being France and West Germany. Processing consists almost entirely of canning, which is performed in quite a large number of smaller businesses in the cultivation area in the northwest of Spain (see also P Salz and JGP Smit, 1986va). Seasonal agreements are reached between mussel farmers and the mussel preserving industry on the purchase price of the mussels (see also 2.2.1). A degree of cooperation among the various mussel processing plants is made possible through the regional associations of the processing industry. These associations have a central support agency, which provides services in the form of advice regarding inspections, economic advice and joint promotion.

As a result of the fairly high import duties on canned products, Spain has so far been able to maintain quite high prices for preserved mussels. In 1985 a 120 gr can of mussels retailed for Dfl.2.50 to Dfl.3.00 compared with Dfl.1.50 for a similar can in the Netherlands. Import duties between the EEC and Spain will however be reduced to 0% in six years, so that Spain will probably meet with more competition then. The extent to which this competition will in fact arise depends partly on how far the various mussel products will be considered capable of substitution by the retail industry and consumers.

4.2.3 Denmark

Unlike Spain, Denmark exports a very large proportion of its processed mussels. It is estimated that around 80% of these products are exported. The Danish export and production statistics make a distinction between airtight (ie. hermetically sealed) and non-airtight packaging of preserved mussels. Presumably the airtight packaging would comprise cans and jars while non-airtight packaging would consist mainly of mussel meat, whether deep-frozen or not. That Denmark produces deep-frozen mussels can be gathered from the price information that is available for this type of product (see Appendix 2). It is also possible that some of this production takes place at the Dutch subsidiary in southern Denmark.

Table 4.9 Production of processed mussels in Denmark (amount in tonnes) *

	Year				
	1976	1980	1981	1982	1985
Airtight packaging	7254	10987	12698	12029	8764
Non-airtight packaging	-	569	441	631	1328

Source: Varestatistiek, Danmarks Statistik

* Unspecified, as to "mussel-tons", or metric tons. Revisor.

Danish preserved mussels are produced by a fairly small number of large processing plants. In addition to mussel products, these enterprises often preserve other fish such as herring and mackerel. In addition to advantages in the areas of, say, marketing, product development, research, administration and underutilization of plants, these operations enjoy benefits when it comes to product distribution. Every

client can be offered a fairly large and complete assortment.

In the 1970s production of preserved mussels saw a sharp increase. At the same time there was a rise in the mussel supply. With the aid of a low raw material price for the mussels and also through considerable attention to product development, exports were able to increase rapidly. Unlike the Dutch enterprises, the Danish ones had a large variety of semi-preserved mussels (ie. various kinds of marinade) at a very early stage. After 1982 sales of airtight products declined somewhat, which was probably attributable in part to the decreased competition from the Netherlands.

Table 4.10 Danish exports of airtight processed mussels (in tonnes * product weight)

Destination	Year			
	1980	1981	1982	1985
Price in Dfl/kg	3.56	3.93	5.42	5.57
Total exports	8272	8223	6438	6280
Of which France	3518	3796	2870	2827
West Germany	1401	1127	684	661
Sweden	1461	1559	1019	754
United Kingdom	527	488	581	688
Austria	171	179	182	175
Switzerland	167	168	115	121
Belgium	147	110	115	98
Netherlands	58	1	-	-
South Africa	109	125	113	60
United States	-	64	49	81
Canada	-	80	97	96

Source: Udenrigshandeln, Danmarks Statistik

* = Unspecified; Revisor.

It can be seen from Table 4.10 that exports are spread over quite a large number of countries. The largest sales losses by the Danish mussel processing industry have occurred in the three most important export markets, France, West Germany and Sweden. Another striking trend indicated in the table is the sharp rise in the average export price. This rise must be connected in part with the greatly increased purchasing activities of the Dutch commercial enterprises, so that the cost price for the Danish mussel preserving industry rose as well. On the other hand it is also possible that there was a change in the assortment of products to better quality products.

Production and export of non-airtight products, presumably mostly mussel meat, has risen sharply in the past few years. Exports to France in particular have increased dramatically in recent years. France now seems to be the most important market for mussel meat in western Europe, especially when we consider the price lists based on deliveries to France (see Appendix 2).

Table 4.11 Danish exports of non-airtight processed mussels (in tonnes product weight) (Unspecified tons; Revisor).

Destination	Year			
	1980	1981	1982	1985
Price in Dfl/kg	4.58	4.59	4.47	4.85
Total exports	398	626	1419	1851
Of which France	22	233	527	889
Belgium	19	4	-	-
Netherlands	24	1	10	
West Germany	155	94	162	172
Italy	140	151	389	372
United Kingdom	23	41	188	247

Source: Udenrigshandeln, Danmarks Statistik

4.2.4 South Korea

Production of processed mussels seems to be determined by market potential much more than it does by the available supply. The decline in the mussel supply from 700,000 mussel-tonnes in 1980 to 360,000 tonnes in 1984 has scarcely affected the production of processed mussels. The processing industry took about 100,000 tonnes from the total supply for production of canned mussels and deep-frozen mussel meat.

Production of processed mussels has in recent years been hovering around 2,000 metric tonnes (product weight), which can be broken down into approximately 1,500 tonnes of preserved mussels and some 500 tonnes of deep-frozen mussel meat. Most of the products are exported to western Europe. Around 1980, when the Dutch industry too was confronted by high raw material prices and a low supply, South Korea was able to increase its exports. In addition the low dollar exchange rate resulted in a lower export price since the national currency is tied quite strongly to the US dollar. Agreed prices are often expressed in US dollars (see Appendix 2).

After 1983 exports of deep-frozen mussel meat in particular declined significantly. This must have been largely attributable to the start of deep-frozen mussel production in western Europe (particularly the Netherlands) and the rising dollar. With the current lower dollar rate the product will quite probably become more competitive again.

It is interesting to note, from the table below, the large share Sweden has in total exports of preserved mussels. Exports to North America and Australia seem to be steadily increasing. Exports to various

EEC countries have seen a steady decrease. It is possible that when there are shortages, as was the case in the 1986/87 season, South Korea's share of the western European market will increase again.

Table 4.12 South Korean exports of processed mussels (in tonnes) (unspecif.)

	Year					
	1980	1981	1982	1983	1984	1985
Canned mussels						
Price in Dfl/kg	4.61				6.25	6.56
Total canned exports	1150				1004	1356
Of which Sweden	505				412	488
Australia	85				154	282
United States	53				99	134
Canada	40				20	119
West Germany	210				107	95
Netherlands	161				47	91
United Kingdom	19				-	27
Deep-frozen mussel meat						
Price in Dfl/kg (EEC-9 avg)	3.50	3.44	3.40	3.00	3.62	-
France	74	99	90	188	16	-
Netherlands	18	18	-	-	-	-
West Germany	1	-	-	-	-	-

Source: Eurostat, Statistical Yearbook of Foreign Trade, Office of Customs Administration, Republic of Korea

4.2.5 Other countries

In addition to Spain, Denmark, South Korea and the Netherlands (see 4.3) a number of European countries have begun producing processed

mussels in the last few years.

The export of deep-frozen mussel meat seems to be of particular interest to the new producers. Substitution of the various kinds of mussel meat probably makes for fewer problems. The trade statistics often include deep-frozen mussel meat under "fresh mussels". (unspecif.)

In 1986 the Irish business Lett and Co. produced some 800 tonnes of deep-frozen mussel meat. In view of the various export prices, most of the product is likely sold in the United Kingdom. The southeast of England, the most prosperous part of the United Kingdom, seems a particularly attractive market. A producer in Wales sells most of his mussel dinners (eg. moules marinière and mussels Italiano) here through luxury department stores such as Marks and Spencer.

In Schleswig-Holstein, West Germany, a business has also begun producing ready-to-eat mussel dishes. The main export destinations are Austria and Switzerland, with France and Belgium also being possible contenders. So far production does not seem to have been very successful, which is possibly a result of the uncertain raw material position (in favour of the purchasing activities of the Dutch enterprises).

A number of years ago Turkey set up a mussel cultivation and processing plant with the help of a Dutch processing equipment company. The plant concentrates on the production of deep-frozen mussel meat. Advertisements for their product regularly appear in the various fishery journals. Their efforts have probably not remained entirely without success. If we go by the average export price of around Dfl.2.80 per kg for "fresh mussels", some 500 tonnes of mussel meat (unspecif.) were exported to Italy and approximately 100 tonnes to France in 1985.

4.3 Developments in the Dutch processing industry

The market for Dutch processed mussels has recovered well since the slump around 1980. Because of the low supply and the resultant high market prices it was difficult for the processing industry to maintain an adequate raw material supply at a workable price. Since clients do not unconditionally accept frequent price increases owing to the nature of the product (see also 4.2.1), they were usually passed on later. At the end of the seventies it was no longer possible, with the sharp rise in the market price, to avoid a large price increase (see Table 4.14). By way of illustration the table below gives an example of the effects of a raw material price increase on the remaining margin for producers and retailers.

Table 4.13 Effect of a raw material price increase on the gross margin of preserved mussels (in guilders)

	I	II
Cost price for mussels, not cleaned, per kg	0.40	1.00
Cost price for mussels, cleaned, per kg 1)	0.62	1.54
Cost price for mussel meat per kg 2)	2.48	6.15
Cost price per 370 ml jar of pickled mussels, ex-water weight 200 gr	0.50	1.23
Selling price in retail outlet	2.20	2.20
Remaining margin for labour, packing and distribution costs and overhead for producer and retailer	1.70	0.97

1) Cleaning and freshwater treatment losses 35%
2) Meat weight 25%

The increased price of Dutch preserved mussels and increased international competition caused sales to drop significantly. Denmark in particular and, to a lesser extent, South Korea provided an increasing amount of competition (see 4.2 ff).

Table 4.14 Export prices of preserved mussels according to country of destination and average price offered (in guilders per kg) 1)

	Year								
	1977	1978	1979	1980	1981	1982	1983	1984	1985
Belgium	5.69	6.26	7.76	9.22	9.14	7.10	6.31	5.91	6.01
France	5.32	5.32	6.55	9.66	6.44	4.61	3.74	3.80	4.32
West Germany	3.20	3.14	3.54	3.43	5.02	3.77	4.30	3.89	3.07
Total fresh supply	0.37	0.55	0.83	1.00	0.42	0.38	0.40	0.41	0.47

1) In 1985 guilders

Source: CBS, PVV

Table 4.15 Estimate of total sales of processed mussels in net product (ie. cleaned) weight (incl shell) in thousands of mussel-tonnes

	Season							
	70-75(avg)	75-80(avg)	80-81	81-82	82-83	83-84	84-85	85-86
Total sales of processed mussels	109	110	87	108	147	241	279	330
Percentage of total mussel sales	16	18	16	15	17	27	34	34
Cooked and deep-frozen mussels as percentage of total sales of processed mussels	0	0	0	ca 10	ca 20	ca 40	ca 50	ca 50

Source: CBS, PVV

Owing to the decline in the market price and, particularly, the sharply increased cheap imports from West Germany and Denmark, mussels could be purchased at a considerably lower price. This lower purchase price and the consequently lower selling price (see Table 4.14) helped

to stimulate the market for preserved mussels.

Other factors also contributed to the boost in sales. After 1980, when there was more certainty about the future of the Eastern Scheldt, processing plants began to increase their investments again. The fact that a number of plants were forced to move to Korringaweg provided a stimulus, in may cases, for more extensive modernization. Improved processing equipment made for more efficient production and a better quality product. Perhaps the most significant stimulus for increasing sales was provided by the expansion of the assortment of mussel products. In addition to the familiar jars of pickled mussels various other products appeared such as mussels in a variety of marinades, cooked and deep-frozen mussels, mussel snacks, etc.

With the introduction of cooked and deep-frozen mussel meat (IQF) an important new market was opened up. By the 1985/86 season the market share of cooked and deep-frozen mussel meat had risen to approximately 50%.

4.3.1 Development of the market for Dutch mussel products

Since the market decline around 1980 and 1981 the position of the Dutch processing industry on the various foreign markets has improved substantially. Sales of preserved mussels on the existing markets have increased considerably while new markets have emerged in countries like Britain, Italy and the United States.

Besides the export of preserved mussels, cooked and deep-frozen mussel meat have become important items for the processing industry. Specific figures concerning the correct volume of these exports are not available. It is estimated that the total export of mussel meat

in 1985 was about 3,000 tonnes,* most of which was shipped to France.

Table 4.16 Breakdown of exports of Dutch preserved mussels (in thousands of tonnes,* product weight)

	Year	
	1981	1985
Destination:		
Belgium	923	1350
France *	100	700
West Germany	42	570
United Kingdom *	50	300
Other countries *	150	400
Total exports *	ca 1200	ca 3250

* Estimates

Source: Eurostat, various national statistics

4.3.2 Position of the Netherlands on the various markets

In the Netherlands and Belgium, the Dutch processing industry has so far experienced relatively little competition from abroad. Only in 1980 and 1981, when the price of the Dutch product rose sharply, did another country, Denmark, import a greater quantity of canned products into the Netherlands than it had previously. Fifty-eight and 238 tonnes* of preserved mussels were imported from Denmark in 1980 and 1981 respectively. In relation to a domestic market of 1,000 to 1,500 tonnes* (product weight) the current import level - less than 10 tonnes* - does not amount to much.

Belgium too received additional preserved mussels from Denmark in the 1980-81 period. Since then the imports have remained higher than in the case with the Netherlands. Although the volume of

* = unspecified; Revisor

Danish imports represents only about 10 to 15% of Dutch imports into Belgium, the Danish canned mussels can be found in most supermarkets. It is interesting to note the wider selection of Danish products being sold (eg. more kinds of marinade).

Table 4.17 Exports of preserved mussels to Belgium in thousands of tonnes (product weight) (unspecified tons)

	Year						
	1977	1980	1981	1982	1983	1984	1985
Origin:							
Netherlands	1327	1023	923	1181	1339	1242	1351
Denmark	65	147	115	110	100	115	98

Source: Eurostat

In France, Denmark is the major foreign supplier of preserved mussels although Dutch exports to France have increased substantially in recent years. It is possible that as a result of the higher Dutch exports of preserved mussels Danish exports have now decreased a little. Spanish exports of preserved and prepared shellfish and mollusks increased dramatically in 1985. These products probably include a high proportion of preserved mussels. Now that Spain has joined the EEC competition on the French market may increase.

In West Germany too Dutch exports of preserved mussels saw a dramatic decline in the 1981 period. More so than in other countries prices seem to have played a major role here. The price level of preserved mussels is lower than it is on other markets (see Table 4.14) probably because of the high degree of concentration in the foodstuffs

retail sector, a large proportion of sales taking place through the large supermarket and hypermarket chains. In 1981 in particular it was virtually impossible for the Dutch processing industry to deliver in the face of such low, competitive prices. The Danish exporters in particular benefited from this situation. In the last few years Dutch exports rose sharply again, partly at the expense of Danish sales.

Table 4.18 Exports of preserved mussels to France

	Year						
	1977	1980	1981	1982	1983	1984	1985
Origin:							
Netherlands *	200	100	100	200	400	600	700
Denmark	2352	3518	3653	3796	3041	2870	2827
Spain **	.	2014	1781	1923	1860	1790	2535

* Estimate

** Exports of preserved or prepared shellfish and mollusks

Source: Eurostat

Table 4.19 Exports of preserved mussels to West Germany (in product weight tonnes) (unspecified)

	Year						
	1977	1980	1981	1982	1983	1984	1985
Origin:							
Netherlands	321	285	42	71	377	475	520
Denmark	1461	1401	1738	1127	720	684	661
Spain *	992	992	1168	1381	1746	1815	2025
South Korea **	-	210	.	..	.	107	95

* Exports of preserved or prepared shellfish and mollusks

** Statistics not available for certain years

Source: Eurostat

Spanish exports of prepared and preserved shellfish and mollusks have also increased significantly in the past few years. Given the sharp decline in Danish exports and the trend in the total market volume, this increase is probably due in large measure to sharply rising exports of preserved mussels. West Germany itself is also endeavouring to market more preserved mussels and other mussel products. Up to now domestic production seems to have been rather limited, however, mainly as a result of the irregular supply of raw materials.

On the other new markets too Denmark is nearly always the major competitor. In most cases the Danish processing industry had built up a substantial market even before the Dutch products appeared. The Netherlands is still hardly exporting any preserved mussels to Sweden, however, which is surprising since both Denmark and South Korea market a substantial proportion of their products in that country.

5. Conclusions

More and more countries have become interested in fishery and the cultivation of mussels in recent years. During this time new mussel farms have sprung up in various locations. Partly as a result of these new cultivation sites the world mussel supply increased from 480 million kg in 1974 to 710 million kg in 1984. Given the continued increasing interest it may be expected that new suppliers will continue to try to secure a position for themselves on the market. Development of cultivation technology and distribution channels will however cost the new producers the necessary time and energy. Moreover the often rather limited space in the coastal waters may constitute a bottleneck in the development of mussel farming.

Within Europe, production in West Germany and Denmark in particular has increased dramatically. In Denmark the greatest growth in the supply took place in the seventies. This growth was stimulated in part by the emergence of the Danish mussel processing plants. In West Germany the supply increased substantially after 1980. Mainly as a result of the activities of the Dutch commercial enterprises and processing plants, the West German supply level has become considerably higher. Since the beginning of the eighties these Dutch businesses have established a number of mussel farms to fish mussels on the German and southern Danish tidal flats. Two processing plants have also been set up; they produce mainly half-processed mussels for the mussel processing industry in the Netherlands. The decision to establish mussel businesses in West Germany was largely motivated by the problems with the irregular domestic supply and sharply in-

creased mussel prices in the late seventies.

All in all imports of fresh mussels have assumed a structurally higher level since the beginning of the eighties. As a result of the increased import opportunities the total supply of mussels has also come to enjoy a clearly higher level. Through increased imports the total supply could be maintained at a high and reasonably stable level for a prolonged period. For the mussel farmers the larger share of imports in the total supply meant that price determination was no longer based only on the Dutch supply but also on the German and Danish supply. Today a low Dutch supply by no means always implies a sharply higher supply price and the possibility of low summations for a number of years.

Higher imports have clearly had a positive influence on the trend in sales. Clients could be accommodated even in seasons when the Dutch supply was low. In addition the low purchase price of imported mussels and the slower increase in the domestic market price helped to create a situation where sales could increase significantly in virtually every market. Ultimately the higher imports seem actually to have had a positive influence on the yield of mussel farms.

In the 1986/87 season the market price rose sharply again as a result of disappointing mussel supplies in both the Netherlands, West Germany and Denmark. The total supply available for retail remained far behind that of previous years. Thus we find that the import of mussels does not yet in all cases provide a sufficient boost to keep the supply at a high and stable level.

Of the total sale of mussels and mussel products, sales of pro-

cessed mussels enjoyed by far the greatest increase. The share of processed mussels in overall sales rose from some 15% in 1980 to around 30% in 1985.

The wider and more stable supply of mussels and the lower raw material price have been important factors for the processing industry. Since a large proportion of the processed products are sold through the general foodstuffs retail sector (groceries, supermarkets etc.), it is important to have reliable delivery and a stable price that is not too high. A supermarket cannot afford to leave a shelf empty or to be without a product, or it will not be long before the product is replaced by another brand or another product. Because the origin of the product is less important to the average buyer than it is in the case of fresh mussels, substitution can occur more readily. A case in point happened around 1980. Increased international competition caused sales of preserved mussels to plummet. Since then sales have increased substantially again. The addition of a number of new products to the available selection, including cooked and deep-frozen mussel meat and mussel snacks, has done a great deal to boost sales.

Because processed mussels keep and are substitutable, trade in this product has a wider international scope. Although this means that there may be more competition, it also implies that more markets can be reached. The principal competitor for the Dutch processing industry is Denmark, with South Korea and Spain following behind. Competition from Denmark and South Korea in particular has increased significantly in the past decade. In addition more and more new producers have been emerging in recent years; they are trying to secure a place for themselves on the market with in some cases entirely new products.

Given the risk of product obsolescence and the increasing competition, causing profit margins to come under pressure, it is important for the Dutch processing industry too to continue to work at product renewal and product development. If a product is given additional added value it will not as readily be substituted in the event of a temporarily stagnant supply or higher mussel prices.

In addition to the growth there has been a greater distribution of sales. New markets have emerged in countries like Britain, Italy and the United States. The existing export markets too - France, Belgium and West Germany - have seen a marked increase in Dutch sales.

Compared with the major competitor, Denmark, Dutch export markets are concentrated in a rather small number of countries. It is interesting to note that the Netherlands exports hardly any preserved mussels to Sweden as yet, whereas Denmark and South Korea have Sweden as a major export market.

Strengths and weaknesses of the mussel processing industry

Netherlands

Strengths	- Good quality raw material (mussel) and good image
	- Good distribution of raw material over a number of regions
Weaknesses	- Relatively small selection of products and small business volume, causing possible disadvantages in distribution and support functions such as marketing and product development

- Sales are significantly affected by temporary price rises and stagnating supplies

Denmark

Strengths
- Businesses are often part of larger fish processing enterprises, so that there is a broader basis for developing distribution channels and for marketing
- Low raw material price owing to the power wielded by the processing companies

Weaknesses
- Mediocre quality raw material and problems with water pollution

Spain

Strengths
- Good quality and image
- Pooling of the commercial activities of the various processed mussel producers
- Seasonal agreements with mussel farmers concerning price and production

Weaknesses
- Fairly high prices
- EEC import duties, even though they are gradually being abolished
- Water pollution problems

South Korea

Strengths
- Low prices

Weaknesses
- High transportation costs
- Simple product
- Prices heavily dependent on the US dollar rate

The market for fresh mussels

Trade in fresh mussels virtually remains limited to the traditional markets in Belgium, France and the Netherlands. The fact that the product does not keep long places practical limits on the distance over which it can be transported. Moreover the development of new distribution channels often costs considerable time, energy and money. It has nevertheless been possible to develop a number of new distribution lines and consumer regions in the domestic market. In the period 1975-1985 in particular domestic consumption rose sharply. Exports to Belgium also followed a favourable trend. As in the Netherlands there has not been much foreign competition in Belgium as yet. The short distance from Yerseke to the markets is largely responsible for this situation.

Exports to France have recovered somewhat following the decline in the late seventies. Despite the fact that the French mussel supply has fallen significantly since 1980, exports have not managed to return to the former level. There is more competition nowadays from Ireland particularly.

An ever increasing proportion of the entire fish retail effort - including fresh mussel sales therefore - is being concentrated in the general foodstuffs sector, ie. supermarkets etc. In Belgium and France in particular specialized fish retail outlets are on the way out. In the Netherlands too there are a number of plans, some at an elementary stage, others more advanced, to have fresh fish sold in the supermarkets on a large scale. This will undoubtedly have consequences for the mussel trade. Greater concentration can strengthen the clients'

market position. In addition more attention will have to be paid, perhaps, to logistics and packaging. Reliable delivery especially plays an important role in the entire process. Distribution through the general foodstuffs outlets also means that a larger public with great purchasing power will have the opportunity to become interested in mussels, which could result in increased mussel consumption in the Netherlands.

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Appendices

APPENDIX 1

An econometric analysis of the mussel trade

On the basis of time periods between 1969 and 1985, statistical analysis techniques were used to investigate the extent of connections, if any, between the various commercial variables. The analysis provides a "simultaneous" system of equations , where in some cases a variable has both an interpretive function and a function requiring interpretation.

In the estimation of this simultaneous system of equations recourse was had to the so-called two-rounds-of-the-smallest-quadrants method. The reason for applying this method is the overidentified character of the system of equations . This overidentification means that the number of structural coefficients to be estimated is smaller than the number of predetermined quantities in the model (see eg. H Rijken van Olst and PE Venekamp, 1975a).

With the aid of the simultaneous system the connections between the following variables were investigated:

PV = Average market price at Yerseke

AN = Gross Dutch supply (including Mussel Fund)

IM = Total Dutch imports of fresh mussels

FAANB= Total mussel supply for the Dutch market = net supply + imports

FAC = Dummy (0,1) variable for establishment of Dutch subsidiaries in West Germany, where 1 = subsidiary and 0 = no subsidiary

T = Trend factor

CON = Purchases of fresh and semi-processed mussels by the preserved mussel industry

ST = Average maximum mussel count per season as issued by the Mussel Fund

VG = Average minimum meat weight per season as issued by the Mussel Fund

AFB = Exports of fresh mussels to Belgium

AFN = Sales of fresh mussels in the Netherlands

AFF = Exports of fresh mussels to France

AF = Supply of fresh mussels in France

AD = Supply of fresh mussels in Denmark

PEX = Average export price level

When the model was estimated, a number of alternative equa ions were estimated by the variables requiring interpretation. Only the equation that produced the best interpretation with significant parameters is quoted. The values in brackets indicate the T values of the parameters.

1. $\text{Log PV} = -1.46 - 0.95 \log \text{AN} - 3.08 \text{ FAC} + 2.26 \log \text{T}$
$\quad\quad\quad\quad (-0.33)(-5.40) \quad\quad (2.07) \quad\quad (2.29)$
$R^2 = 0.69$

The flexibility of the market price is 0.95, which means that a 10% increase in the supply reduces the market price by 9.5%. For the period 1967 to 1977 this value was 1.05 (see JGP Smit, 1979a), which indicates that the price has become less responsive to fluctuations in the Dutch supply. This is mainly attributable to increased imports in the past few years. Since the number with such higher imports is small, it was not found to have a sufficient significant effect on the mussel farmer's price as yet. The establishment of Dutch subsidiaries in West Germany, indicated by means of the dummy variable FAC, was found to have a sufficient significant effect, however.

2. $\text{Log IM} = 13.40 + 3.60 \log PV + 3.01 FAC$
$(-2.71) \quad (2.85) \qquad (3.75)$
$R^2 = 0.52$

A 1% increase in the market price leads to 3.6% higher imports. The establishment of subsidiaries in West Germany is also shown to have a significant influence in this equation. The interpretation percentage - 52% - is probably so low because of natural factors in West Germany which explain another part of the variations in imports.

3. $\text{Log AFN} = - 27.26 + 6.7 \log T$
$(-11.28) \quad (12.04)$
$R^2 = 0.90$

The increase in mussel consumption in the Netherlands is shown to be largely trend related. The market price was of no significance at all, which may indicate that the Dutch consumer is not very much affected by price changes. The real effect of prices can actually be measured only on the basis of data on consumer prices. In the present case, only an indirect connection is measured. The availability of mussels (both the supply and domestic production) is likewise found to have little effect on the volume of Dutch consumption.

4. $\text{Log AFB} = - 7.65 + 0.29 \log AN + 2.18 \log T$
$(-6.82) \quad (4.56) \qquad (8.79)$
$R^2 = 0.86$

The volume of exports to Belgium, like Dutch consumption of fresh mussels, is not shown to be very much affected by price fluctuations. The principal interpretive factors for the

exports to Belgium are the availability of mussels (Dutch supply) and a trend-related increase.

5. $\text{Log AFF} = 8.82 - 0.89 \log \text{PV} - 0.57 \log \text{AF}$
$\qquad\qquad\qquad\quad (10.34)(-5.61) \qquad\quad (3.55)$
$R^2 = 0.75$

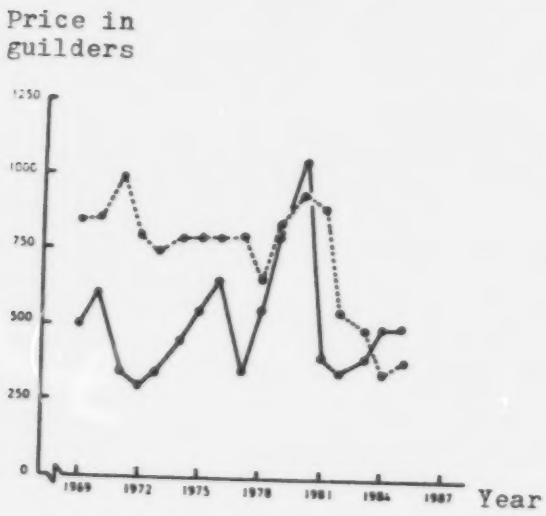
Unlike the two preceding cases, exports of fresh mussels to France are indeed affected by the price. A 10% rise in the market price causes a 8.9% reduction in exports to France. The volume of the French domestic supply is also found to affect exports.

6. $\text{Log CON} = -19.4 - 0.51 \log \text{AD} - 0.66 \log \text{PEX} + 6.59 \log \text{T}$
$\qquad\qquad\quad (-1.30) \quad (-1.51) \qquad\quad (-2.27) \qquad\quad (1.95)$
$R^2 = 0.78$

The total purchases of raw materials (fresh mussels and mussel meat) by the mussel preserving industry give a reasonable indication of total sales of processed mussels. Discrepancies between these values may arise through stockpiling (occurs only on a limited scale) and variations in cleaning losses. Sales of preserved mussels are also found to be price dependent (the average export price is taken as the standard here). A 10% price increase causes purchases by the mussel processing industry (or, indirectly, sales) to drop by 6.6%. A certain trend related increase in sales is also noted. The mussel supply in Denmark seems to have a less significant effect on sales. This lower T value is caused by a certain correlation between the trend factor and the Danish supply. Moreover, just in the last few years a good proportion of the Danish supply is being processed in the Netherlands. This Danish supply level was used as an indicator for the

degree of competition which the Danish mussel preserving industry represents for the Dutch industry. The total mussel supply in the Netherlands, which is not included in the above equasion, also gave quite a reasonable if somewhat limited explanation for the variations in the purchases by the processing industry.

Fig 3 Graph of the market price per 1,000 kg (*) and the export price of preserved mussels in gross product weight per 100 kg (.) in the period 1969-1985 (deflated prices)



.----. Export price of preserved mussels per 100 kg

.——. Market price per 1,000 kg

It was difficult to establish a link between the average export price level and the market price. If we examine the graph it would appear at first glance that there is a connection between the two values. The emergence of a lower correlation seems to be largely the result of the price setting behaviour of the preserved mussel industry, changes in the market price being passed on in the export price of preserved mussels after some delay. An estimation of a link where the export price was correlated with a

1-year-delayed market price gave a considerably better result.

7. $\text{Log PEX}(i) = 21.1 + 0.47 \log \text{PV}(i-1) - 3.77 \log t\,(i-1)$
$\qquad\qquad\qquad\quad (6.49)\ (2.83)\qquad\qquad\quad (-4.90)$
$R^2 = 0.63$

The above equation shows , in addition to a connection with the market price, a trend-related decline in the export price of preserved mussels.

By way of completing this analysis the following equation of definitions, which does not call for estimations, is presented.

8. $s(AN + IM) = AFN + AFB + AFF + AOV + sCON$

Here AOV represents the sale of fresh mussels in "other countries"; s is equal to the percentage of mussels that remains after deduction of the cleaning losses.

The maximum mussel count and minimum meat weight were not shown to provide a significant or consistent explanation for variations in sales in any of the equations. It is possible that the true average, rather than the statutory meat weight and mussel count, would have offered a better explanation. The information concerning these values was available for only a limited number of years, however.

APPENDIX 2

Table 1 Wholesale prices for Korean preserved mussels (from South Korea f.o.b.)

	Month						
	Oct 82	Jan 85	Jun 85	Oct 85	Jul 86	Oct 86	Dec 86
Cooked mussels	$ 8.50	$ 8.00	$ 7.50	$ 7.70	$ 7.60	$ 10.00	$ 10.00
24 x 225 gr	Df123.21	Df128.24	Df125.80	Df122.15	Df118.84	Df123.20	Df122.20
per kg product wt.	Dfl 4.30	Dfl 5.30	Dfl 4.78	Dfl 4.10	Dfl 3.49	Dfl 4.29	Dfl 4.11
Smoked mussels	-	$ 32.00	$ 30.00	$ 29.50	$ 24.00	$ 32.00	$ 32.00
100 x 100 gr	-	Df1112.96	Df1103.93	Df187.02	Df159.52	Df174.24	Df171.04
per kg product wt	-	Df111.30	Df110.39	Dfl 8.70	Dfl 5.59	Dfl 7.42	Dfl 7.10

Source: Infofish Trade News

Table 2 Wholesale prices for deep-frozen mussel meat (from France c.i.f. in $ per kg)

Origin	Month			
	July 86	Sep 86	Dec 86	Feb 87
Denmark				
250-400 pce per kg	2.50	2.40	2.50	2.50
350-500 pce per kg	2.30	2.25	2.30	2.30
500-700 pce per kg	2.20	2.07	2.20	2.20
Netherlands	-	-	2.50	2.30
Ireland	-	-	2.50	2.50
South Korea	-	-	-	1.50
$/Dfl rate	2.48	2.44	2.24	2.05

Source: Globefish, European Fish Price Report